

I made in a piece of Lead a small Hole with a Pin, whose breadth was the 42th part of an Inch. For 21 of those Pins laid together took up the breadth of half an Inch. Through this Hole I let into my darkened Chamber a beam of the Sun's Light, and found that the shadows of Hairs, Thred, Pins, Straws, and such like slender substances placed in this beam of Light, were considerably broader than they ought to be, if the rays of Light passed on by these Bodies in right Lines. And particularly a Hair of a Man's Head, whose breadth was but the 280th part of an Inch, being held in this Light, at the distance of about twelve Feet from the Hole, did cast a shadow which at the distance of four Inches from the Hair was the sixtieth part of an Inch broad, that is, above four times broader than the Hair, and at the distance of two Feet from the Hair was about the eight and twentieth part of an Inch broad, that is, ten times broader than the Hair, and at the distance of ten Feet was the eighth part of an Inch broad, that is 35 times broader.

Nor is it material whether the Hair be encompassed with Air, or with any other pellucid substance. For I wetted a polished plate of Glass, and laid the Hair in the Water upon the Glass, and then laying another polished plate of Glass upon it, so that the Water might fill up the space between the Glasses, I held them in the aforesaid beam of Light, so that the Light might pass through them perpendicularly, and the shadow of the Hair was at the same distances as big as before.

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The shadows of scratches made in polished plates of Glass were also much broader than they ought to be, and the Veins in polished plates of Glass did also cast the like broad shadows. And therefore the great breadth of these shadows proceeds from some other cause than the refraction of the Air.

Let the Circle X represent the middle of the Hair; *Fig. 1.* ADG, BEH, CFI, three rays passing by one side of the Hair at several distances; KNQ, LOR, MPS, three other rays passing by the other side of the Hair at the like distances; D, E, F and N, O, P, the places where the rays are bent in their passage by the Hair; G, H, I and Q, R, S, the places where the rays fall on a Paper GQ; IS the breadth of the shadow of the Hair cast on the Paper, and TI, VS, two rays passing to the points I and S without bending when the Hair is taken away. And it's manifest that all the Light between these two rays AI and VS is bent in passing by the Hair, and turned aside from the shadow IS, because if any part of this Light were not bent it would fall on the Paper within the shadow, and there illuminate the Paper contrary to experience. And because when the Paper is at a great distance from the Hair, the shadow is broad, and therefore the rays TI and VS are at a great distance from one another, it follows that the Hair acts upon the rays of Light at a good distance in their passing by it. But the action is strongest on the rays which pass by at least distances, and grows weaker and weaker accordingly as the rays pass by at distances greater and greater, as is represented in the Scheme: For thence it comes to pass, that the shadow of the Hair is much broader in proportion to the distance of

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